REMARKS/INTERVIEW SUMMARY

I. Introduction

This amendment is being submitted following a March 6, 2006 telephone interview. During the Interview, Applicants made the arguments set forth below. The Interview is summarized for purposes of documenting the interview at the end of this Amendment.

The interview and this amendment is in response to the September 6, 2005 Office Action. The deadline for responding has been extended to March 6, 2006 by way of a request for an extension of time made herewith.

New claims 27-37 have been added taking into consideration the Examiner's comments during the interview. Applicants believe all of the pending claims clearly distinguish over the applied references.

Accordingly, claims 1-37 are now pending. Of these claims, claims 1, 14, 20 and 24 are independent claims. The pending claims are currently rejected in view of various applied references for the reasons set forth in the office action. The references used to reject the claims include U.S. Patent No. 6,240,129 to Reusens, U.S. Patent No. 5,612,978 to Blanchard, U.S Patent No. 5,822,368 to Wang, and U.S. Patent No, 6,717,908 to Vijayan.

As will be discussed below, none of the references, alone or in combination, teach, disclose or suggest the claimed subject matter.

II. The Present Invention

As discussed in the pending patent application, various aspects of the invention are directed to methods and apparatus for use in an OFDM communications system wherein data symbols are generated, e.g., modulated, and **recovered in the time domain as opposed to the frequency domain.**

In various exemplary embodiments the transmitter of the present invention modulates data symbols in the time domain to a prescribed set of time instants corresponding to a symbol duration. The mapped symbols are smoothly connected to form the transmitted OFDM signal such that the generated signal corresponding to a user includes frequency components at the tones allocated to that particular user. The time domain OFDM signaling method of the present invention has the advantage over the known frequency domain OFDM signaling method in that it can, in many cases, provide a substantially lower peak-to-average ratio than known methods where the OFDM signal is constructed in the frequency domain.

In a multiple access system, the transmitted signals from different transmitters, each using a set of tones allocated to a different user, are often mixed in the communications channel prior to arriving at an individual user's receiver. In accordance with one exemplary

receiver embodiment of the present invention, in order to eliminate multiple access interference the receiver first samples the received signal and then transforms the signal from the time domain to the frequency domain, e.g., by performing an FFT operation. After the signal has been converted into the frequency domain, the signal is filtered to remove tones of other users. This results in a signal including the tones allocated to the user of the receiver but not other users.

After removal of the tones of other users from the signal, **the signal is converted back into the time domain to facilitate recovery of the transmitted symbols**, The symbols may then be recovered **from the time domain signal** by mapping values of the filtered time domain signal **at instants in time used to transmit symbol values to values in a set of symbol values**.

III. The Pending Claims Are Patentable Over the Applied References

Applicants will now address and overcome each of the rejections.

1. The 102 (e) Rejection of Claims 20, 22 and 24

By teaching mapping to symbols in the frequency domain, fromresults of a Fourier Transform FT' corresponding to a period of time, the Reusens et al. patent actually teaches away from the subject matter of claim 20 which recites "**mapping values of the OFDM signal** after channel equalization ***at instants in time*** …"

Representative claim 20 recites:

> A method of processing a received orthogonal frequency division multiplexed signal to generate symbol values, the method comprising;
> **performing a channel equalization** operation on the received OFDM signal **in the time domain**; and
> **mapping values of the OFDM signal** after channel equalization ***at instants in time*** **used to transmit symbol values to symbol values.**

The Examiner rejected claim 20 as being anticipated by the Reusens patent stating:

> Reusens discloses a method of processing a received orthogonal frequency division multiplexed signal to generate symbol values, the method comprising; performing a channel equalization operation on the received OFDM signal in the time domain (Fig. 1, REF TEQ); and mapping values of the OFDM signal after channel equalization at instants in time used to transmit symbol values to symbol values (Fig. 1, Ref Demap). (Office Action page 2)

A review of the Resuens patent reveals that the reference actually teaches **mapping to symbol values in the frequency domain**, after converting the received signal from the time to the frequency domain. The fact that the mapping to symbol values occurs in the frequency domain is clear from the fact that the Demap element shown in Fig. 1 follows a fourir transform operation implemented by element FT' and equalization performed in the frequency domain by element FEQ. While the DEMAP

element is subsqequent to the time domain equalization process performed by TEQ, it clearly follows conversion of the signal into the frequency domain. The frequency domain signal generated by the Fourier Transform FT' corresponds to a period of time since it is the result of a Fourier Transform FT' corresponding to a period of time.

Accordingly, as discussed above, the Resuens et al. patent actually teaches away from "**mapping values of the OFDM signal** after channel equalization ***at instants in time***" by teaching recovering symbols in the frequency domain.

In view of the above discussion, the rejection of claim 20 and claim 21 which depends therefrom should be withdrawn.

The rejection of claim 24 which is also based on the Reusens et al. patent should be withdrawn for similar reasons.

2. The 103 Rejection of Claims 1-9

In the Office Action the Examiner rejected claims 1-9 under 35 U.S.C. §103 as being unpatentable over Blanchard patent in view of the Wang patent.

Applicants respectfully submit that the Blanchard patent which is directed to filtering a wideband Direct Sequence (DS) spread spectrum signal to remove a

frequency hopped spread spectrum signal **is devoid of the concept of different subsets of tones being allocated to different users** and **removing tones which are not in a subset of tones allocated to a first user from which symbols are to be recovered.**

Accordingly, **it should be appreciated that the applied references disclose something that is very different from what is being claimed** and even if combined they would not result in the claimed invention.

In rejecting claim 1-2, the Examiner stated:

> ... Blanchard discloses a method of processing a frequency division multiplexed signal representating a plurality of symbols and including a plurality of tones, a first subset of said plurality of tones being allocated to a first user ... filtering the frequency domain signal to remove tones in said plurality of tones which are not included in said first subset of tones (Fig. 1, Ref 22)

Applicants respectfully submit that there is no discussion in the applied reference of allocating a subset of tones to a first user. The Frequency Hopped (FH) spread spectrum signals which are rejected appear to coincide with, and are interference to, the tones used by the direct sequence (DS) spread spectrum signal of interest.

If the Examiner intends to maintain the rejection based on the Blanchard patent it is respectfully requested that the Examiner identify what subset of tones

the Examiner asserts are assigned to a first user and how the tones of the Frequency Hopped signal to be filtered out relate to the subset of tones the Examiner identifies.

Applicants respectfully submit that the Blanchard patent does not distinguish between tones assigned to different users but is simply trying to filter out the Frequency Hopped spread spectrum signal which interferes with the DS signal. One would not be motivated to use such a system intended to filter out Frequency Hopped spread spectrum signals without regard to which subsets of tones were assigned to individual users in a method such as that recited in claim 1 where the concept of a subset of tones being allocated to a user is important since the symbols will be recovered from the allocated subset of tones.

Accordingly, it is respectfully submitted that the rejections of claims 1-9 based on the Blanchard et al. patent should be withdrawn

3. The 103 Rejection of Claims 10-13

The rejection of dependent claims 10-13 is based on the Blanchard patent and should be withdrawn for the same reasons that the rejection of claim 1 based on the Blanchard patent should be withdrawn.

However, the rejection of claims 10-13 should also be withdrawn because it is also based on an apparent misunderstanding of the Vijayan patent.

In rejecting claims 10-13 the Examiner states:

> Vijayan discloses a time instant to symbol mapping module **coupled to the frequency to time domain transform module** for mapping signal values to points in time to symbol values (Fig. 3, Ref 46, soft decision quantizer and Fig 4, col. 7, lines 37 to col. 8, line 5) (bold added for emphasis)

Applicants respectfully submit that there seems to be a miss-understanding due to the slightly unusual use of an Inverse FFT in the receiver of the Vijayan patent which the Examiner interprets as **a frequency to time domain transform module**. While an IFFT serves in many systems as a frequency to time domain transform module, it does not actually serve this purpose in the Vijayan et al. reference. In fact, in the Vijayan et al. reference the IFFT is used to convert the received signal **into the frequency domain**, i.e., the output of the circuit is a plurality of sub-carriers. Applicants respectfully submit that the transmitter shown in Fig. 2 of the Vijayan et al. patent supports Applicants' assertions and helps facilitate an understanding of the use of the IFFT in the receiver of Fig. 3.

Note that the Vijayan et al. patent uses an FFT 36 in the transmitter where an IFFT might be used in other systems. The input to the FFT 36 in the transmitter is the plurality of individual sub-carriers. It should be

appreciated that when the IFFT 42 performs the inverse of the FFT 36, the result in the receiver is NOT to transform the received signal into the time domain but actually to transform the signal into the frequency domain. Note that the output of the IFFT is a plurality of sub-carrier signals (i.e., frequency domain signals) which are generated from a block of time domain values input to the FFT 42.

The ability to use the FFT in the transmitter and the IFFT in the receiver can be understood if one looks at the functions as two processing steps with the requirement that the receiver perform the inverse of the transmitter operation.

Accordingly, it should be appreciated that despite the use of the IFFT in the receiver, the Vijan et al. patent actually teaches away from the present invention **by teaching mapping from the frequency domain to symbol values**, where the frequency domain mapping depends on a period of time as a result of the conversion into the frequency domain prior to the mapping operation.

Accordingly, it should be appreciated that the Vijan et al. patent does not disclose, as recited in claim 10:

> mapping values of the filtered time domain signal **at instants in time** used **to transmit symbol values** to values in a set of symbol values

4. The 103 Rejection of Claims 14-19

The rejection of claims 14 and 19 is based on a combination of the Blanchard patent and the Vijayan patents. Both of these patents have been discussed above with respect to the rejection of claims 1 and 10. Accordingly, Applicants will not repeat the arguments in detail again.

However, Applicants respectfully submit the Blanchard patent does not render obvious the "tone filter for filtering … tones other than those included in the first subset" as discussed above with respect to the rejection of claim 1. Applicants further submit that the Vijayan patent does not disclose "a time instant to symbol mapping module …" as discussed at length with respect to the rejection of claim 10. Accordingly, the rejection of both claims 14 and 19 should be withdrawn.

5. The 103 Rejections of The Remaining claims

The rejections of the remaining claims are based on a combination of the references discussed above. Applicants respectfully submit that the Arguments raised above with respect to these references are also applicable to the other rejections based on the references made by the Examiner. Accordingly, it is respectfully submitted that the remaining rejections

should be withdrawn for the reasons discussed above with respect to the rejections of the other claims.

IV. Interview Summary

1. Date of Interview: March 6, 2006

2. Type of Interview: Telephone

3. Name of Participants:
Applicants' rep: Michael Straub
Examiner: Steven H. D. Nguyen

4. Exhibit(s) Shown: No Exhibits were shown however an Interview Outline was submitted prior to the Interview. The Interview Outline which was submitted by E-mail prior to the Interview is attached hereto as an Appendix.

5. Claims discussed: All of the pending claims were discussed.

6. References Discussed: During the interview the references used to reject the claims were discussed including each of the references discussed in the remarks set forth above in this amendment.

7. Proposed Amendments discussed:
No proposed amendments were discussed.

8. Discussion of General Thrust of the Principal Arguments

Applicants arguments which were presented in the Interview are set forth in the preceding portions of this amendment in detail.

12. **Other Pertinent Matters Discussed:**

None.

13. **General Results/Outcome of Interview**

The Examiner agreed to review and consider Applicants Arguments further after receiving Applicants written response

V. Request For Clarification

If the Examiner persists in any of the rejections or issues new rejections it is requested that the Examiner specifically identify what the Examiner contends corresponds to each element of the claim the Examiner rejects.

For example, with respect to claim 1, what in the applied reference does the Examiner contend corresponds to i) the plurality of tones and ii) the first subset of tones and where is the first subset of tones described as being allocated to a first user?

With respect to claim 14, what in the applied reference does the Examiner assert are the "**signal values at points in time**" and where does the reference show the identified **signal values being mapped to symbol values**?

With respect to new claim 36 which depends from claim 1, what in the applied references does the Examiner assert corresponds to **another subset of tones** allocated to another user?

With respect to claim 34 what does the Examiner assert corresponds to the recited: "**individual instants in time within an OFDM symbol period**"?

Applicants respectfully submit that the above information, as well as clear information identifying what the Examiner asserts corresponds to each individual claim element of any other claim which is rejected, is needed so that Applicants can have a full and fair opportunity to respond to any new or repeated rejections.

VI. Conclusion

In view of the foregoing amendments and remarks, Applicants respectfully submit that the pending claims are in condition for allowance. Accordingly, Applicants request that the Examiner pass this application to issue.

If there are any outstanding issues which need to be resolved to place the application in condition for allowance **the Examiner is invited to contact Applicants' undersigned representative by phone to discuss and hopefully resolve said issues**. To the extent necessary, a petition for extension of time under 37 C.F.R. 1.136 is hereby made and any required fee is authorized to be charged to the deposit account of Straub & Pokotylo, deposit account number 50-1049.

Respectfully submitted,

March 6, 2006

Michael P. Straub, Attorney
Reg. No. 36,941
Tel.: (732) 542-9070

CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that this paper (and any accompanying paper(s)) is being facsimile transmitted to the United States Patent Office on the date shown below.

Michael P. Straub
Type or print name of person signing certification

Signature

March 6, 2006
Date

APPENDIX

COPY OF INTERVIEW OUTLINE SUBMITTED BY E-MAIL
PRIOR TO MARCH 6, 2006 INTERVIEW
APPLICATION S.N.09/931,469

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Attorney Docket No.: **Flarion-21 (55)**

Appl. No.: **09/931,469**

Applicants: **Rajiv LAROIA, Junyi LI**

Filed: **August 16, 2001**

Title: **OFDM COMMUNICATIONS METHODS AND APPARATUS**

TC/A.U.: **2665**

Examiner: **Steven H. D. Nguyen**

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INTERVIEW DISCUSSION OUTLINE

Sir:

This Interview Outline is in reply to the Office Action mailed on September 6, 2005.

No amendments have been made to the claims. A full listing of claims begins on page 2 of this paper.

Remarks/Arguments begin on page 12 of this paper.

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (original): A method of processing a frequency division multiplexed signal representing a plurality of symbols and including a plurality of tones, a first subset of said plurality of tones being allocated to a first user, the method comprising the steps of:

performing a time domain to frequency domain transform operation on the frequency division multiplexed signal to generate a frequency domain signal there from;

filtering the frequency domain signal to remove tones in said plurality of tones which are not included in said first subset of tones;

performing a frequency domain to time domain transform operation on the filtered frequency domain signal to generate a filtered time domain signal; and

recovering symbols transmitted to the first user from the filtered time domain signal.

Claim 2 (original): The method of claim 1, wherein recovering symbols includes:

performing a channel equalization operation on the filtered time domain signal.

Claim 3 (original): The method of claim 2, wherein recovering symbols further includes performing a channel estimation operation, said channel estimation operation including:

identifying a training symbol in the filtered time domain signal; and

generating at least one channel estimation as a function of the difference between the identified training symbol and a known training symbol value.

Claim 4 (original): The method of claim 2, wherein the frequency division multiplexed signal corresponds to multiple symbol periods, the portion of the received signal corresponding to each symbol period including at least one training symbol; and wherein recovering symbols further includes performing a channel estimation operation, said channel estimation operation including, for each symbol period:

identifying a training symbol in the filtered time domain signal; and

generating at least one channel estimation as a function of the difference between the identified training symbol and a known training symbol value.

Claim 5 (original): The method of claim 2, wherein the frequency division multiplexed signal corresponds to multiple dwells, each dwell being a period of time equal to multiple symbol periods, the first user being allocated the first subset of said plurality of tones for use throughout one of said dwells, the method further comprising:

performing a channel estimation operation including, for each dwell:

identifying a training symbol in the filtered time domain signal received during one symbol period within the dwell; and

generating a channel estimation as a function of the difference between the identified training symbol and a known training symbol value.

Claim 6 (original): The method of claim 5, wherein performing a channel equalization operation includes:

using a channel estimation generated from a training symbol received during a dwell to perform a channel equalization operation on a portion of the filtered time domain signal corresponding to a symbol period in said dwell which does not include said identified training symbol.

Claim 7 (original): The method of claim 5, wherein all of a plurality of symbols received during one of said symbol periods in each dwell include training symbols;

wherein performing a channel estimation operation for each dwell further includes:

generating a channel estimation for each of the training symbols received during said one of said symbol periods.

Claim 8 (original): The method of claim 7, wherein performing a channel equalization operation includes:

using the channel estimations generated from each of the received training symbols during said one of said symbol periods in each dwell, to perform separate channel equalization operations on each portion of the filtered time domain signal corresponding to a symbol in at least one other symbol period included in the same dwell in which the training symbols used to generate the channel estimations were received.

Claim 9 (original): The method of claim 8, the symbol period in which all received symbols are training symbols is located at the center of each dwell.

Claim 10 (original): The method of claim 2,

wherein the frequency division multiplexed signal is an orthogonal frequency division multiplexed signal; and

wherein recovering symbols transmitted to the first user includes:

mapping values of the filtered time domain signal at instants in time used to transmit symbol values to values in a set of symbol values.

Claim 11 (original): The method of claim 10, wherein recovering symbols transmitted to the first user further includes:

performing a symbol value to symbol value mapping operation to map symbol values generated by mapping values of the filtered time domain signal to values in another set of symbol values.

Claim 12 (original): The method of claim 10,

wherein performing a time domain to frequency domain transform operation includes performing one of a Fast Fourier Transform operation and a Discrete Fourier Transform operation; and

wherein performing a frequency domain to time domain transform operation includes performing one of an Inverse Fast Fourier Transform operation and an Inverse Discrete Cosine Transform operation.

Claim 13 (original): The method of claim 12, further comprising:

receiving the frequency division multiplexed signal from a communications channel including frequency division multiplexed signals corresponding to users other than the first user.

Claim 14 (original): An apparatus for processing a frequency division multiplexed signal representing a plurality of symbols and including a plurality tones, a first subset of said plurality of tones being allocated to a first user, the apparatus comprising:

a time to frequency domain transform module for generating a frequency domain signal from the frequency division multiplexed signal;

a tone filter for filtering from the frequency domain signal generated by the time domain to frequency domain transform module tones other than those included in the first subset to thereby generate a filtered frequency domain signal;

a frequency to time domain transform module for performing a frequency domain to time domain transform operation on the filtered frequency domain signal to thereby generate a time domain signal; and

a time instant to symbol mapping module coupled to the frequency to time domain transform module for mapping signal values at points in time to symbol values.

Claim 15 (original): The apparatus of claim 14, further comprising:

a channel equalization module coupling said frequency to time domain transform module to the time instant to symbol mapping module, the channel equalization module performing channel equalization operations on said time domain signal.

Claim 16 (original): The apparatus of claim 15, further comprising:

a channel estimation circuit coupled to said frequency to time domain transform module and to the channel equalization module for generating at least one channel estimate from the time domain signal and for supplying the channel estimate to the channel equalization module.

Claim 17 (original): The apparatus of claim 16, further comprising;

a symbol to symbol mapping module coupled to the time instant to symbol mapping module.

Claim 18 (original): The apparatus of claim 16, further comprising:

a cyclic prefix discarding circuit coupled to the time to frequency domain transform module for discarding portions of the frequency division multiplexed signal corresponding to cyclic prefixes.

Claim 19 (original): The apparatus of claim 14,

wherein the frequency division multiplexed signal is an orthogonal frequency division multiplexed signal;

wherein the time to frequency domain transform module is a Fast Fourier Transform circuit; and

wherein the frequency to time domain transform module is an inverse Fast Fourier Transform circuit.

Claim 20 (original): A method of processing a received orthogonal frequency division multiplexed signal to generate symbol values, the method comprising;

performing a channel equalization operation on the received OFDM signal in the time domain; and

mapping values of the OFDM signal after channel equalization at instants in time used to transmit symbol values to symbol values.

Claim 21 (original): The method of claim 20, further comprising:

filtering the OFDM signal in the frequency domain to remove undesired signal tones prior to performing said channel equalization operation on the received signal in the time domain.

Claim 22 (original): An orthogonal frequency division multiplexed (OFDM) signal receiver for receiving an OFDM signal, the receiver comprising:

a time domain channel equalization module for performing a channel equalization operation on the OFDM signal in the time domain; and

a time instant to symbol mapping module for mapping values of the OFDM signal after channel equalization at instants in time used to transmit symbol values to symbol values.

Claim 23 (original): The receiver of claim 22, further comprising:

a time to frequency domain signal transform circuit for converting the received OFDM signal to the frequency domain;

a tone filter coupled to the time to frequency domain signal transform circuit for performing a filtering operation on the received OFDM signal in the frequency domain; and

a frequency domain to time domain transform circuit coupling the tone filter to the time domain

channel equalization module for converting the filtered signal back into the time domain.

Claim 24 (original): A communications system comprising:

an orthogonal frequency division multiplexed signal transmitter including:

a symbol to time instant mapping module for mapping a plurality of symbols to be transmitted to uniformly spaced points in time within a time period corresponding to a symbol duration; and

an orthogonal frequency division multiplexed signal receiver including:

a time instant to symbol mapping module for mapping signal values at points in time used to transmit symbols to symbol values.

Claim 25 (original): The system of claim 24, wherein the receiver further includes:

a time domain to frequency domain transform circuit for converting a received signal from the time domain to the frequency domain;

a tone filter coupled to the time domain to frequency domain transform circuit for filtering tones, outside a set of tones used by the receiver, from the received signal in the frequency domain; and

a frequency domain to time domain transform circuit for coupling the tone filter to the time instant to symbol mapping module.

Claim 26 (original): The system of claim 24, wherein the receiver further includes a time domain channel equalization circuit coupled between the frequency domain to time domain transform circuit and the time instant to symbol mapping circuit.

REMARKS/ARGUMENTS

I. Introduction

This interview outline is being submitted in preparation for a March 6, 2006 telephone interview. The interview and this outline is in response to the September 6, 2005 Office Action. **Applicants' representative suggests that the Examiner print a copy of the references to have them handy during the interview so that they can be easily discussed.**

Claims 1-26 are pending. Of these claims, claims 1, 14, 20 and 24 are independent claims. The pending claims are currently rejected in view of various applied references for the reasons set forth in the office action. The references used to reject the claims include U.S. Patent No. 6,240,129 to Reusens, U.S. Patent No. 5,612,978 to Blanchard, U.S Patent No. 5,822,368 to Wang, and U.S. Patent No, 6,717,908 to Vijayan.

As will be discussed below, none of the references, alone or in combination, teach, disclose or suggest the claimed subject matter.

II. The Present Invention

As discussed in the pending patent application, various aspects of the invention are directed to methods and apparatus for use in an OFDM communications system wherein data symbols are generated, e.g., modulated, and **recovered in the time domain as opposed to the frequency domain.**

In various exemplary embodiments the transmitter of the present invention modulates data symbols in the time domain to a prescribed set of time instants corresponding to a symbol duration. The mapped symbols are smoothly connected to form the transmitted OFDM signal such that the generated signal corresponding to a user includes frequency components at the tones allocated to that particular user. The time domain OFDM signaling method of the present invention has the advantage over the known frequency domain OFDM signaling method in that it can, in many cases, provide a substantially lower peak-to-average ratio than known methods where the OFDM signal is constructed in the frequency domain.

In a multiple access system, the transmitted signals from different transmitters, each using a set of tones allocated to a different user, are often mixed in the communications channel prior to arriving at an individual user's receiver. In accordance with one exemplary receiver embodiment of the present invention, in order to eliminate multiple access interference the receiver first samples the received signal and then transforms the signal from the time domain to the frequency domain, e.g., by performing an FFT operation. After the signal has been converted into the frequency domain, the signal is filtered to remove tones of other users. This results in a signal including the tones allocated to the user of the receiver but not other users.

After removal of the tones of other users from the signal, **the signal is converted back into the time domain to facilitate recovery of the transmitted symbols,** The symbols may then be recovered **from the time domain signal** by mapping values of the filtered time domain signal **at instants in time used to transmit symbol values to values in a set of symbol values.**

III. The Pending Claims Are Patentable Over the Applied References

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1. The 102 (e) Rejection of Claims 20, 22 and 24

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Representative claim 20 recites:

> A method of processing a received orthogonal frequency division multiplexed signal to generate symbol values, the method comprising;
> **performing a channel equalization** operation on the received OFDM signal **in the time domain;** and
> **mapping values of the OFDM signal** after channel equalization ***at instants in***

time **used to transmit symbol values to symbol values.**

The Examiner rejected claim 20 as being anticipated by the Reusens patent stating:

> Reusens discloses a method of processing a received orthogonal frequency division multiplexed signal to generate symbol values, the method comprising; performing a channel equalization operation on the received OFDM signal in the time domain (Fig. 1, REF TEQ); and mapping values of the OFDM signal after channel equalization at instants in time used to transmit symbol values to symbol values (Fig. 1, Ref Demap). (Office Action page 2)

A review of the Resuens patent reveals that the reference actually teaches **mapping to symbol values in the frequency domain**, after converting the received signal from the time to the frequency domain. The fact that the mapping to symbol values occurs in the frequency domain is clear from the fact that the Demap element shown in Fig. 1 follows a fourir transform operation implemented by element FT' and equalization performed in the frequency domain by element FEQ. While the DEMAP element is subsqequent to the time domain equalization process performed by TEQ, it clearly follows conversion of the signal into the frequency domain. The frequency domain signal generated by the Fourier Transform FT' corresponds to a period of time since it is the result of a Fourier Transform FT' corresponding to a period of time.

Accordingly, as discussed above, the Resuens et al. patent actually teaches away from **"mapping values of the OFDM signal** after channel equalization ***at instants in time***" by teaching recovering symbols in the frequency domain.

In view of the above discussion, the rejection of claim 20 and claim 21 which depends therefrom should be withdrawn.

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Applicants respectfully submit that the Blanchard patent which is directed to filtering a wideband Direct Sequence (DS) spread spectrum signal to remove a frequency hopped spread spectrum signal **is devoid of the concept of different subsets of tones being allocated to different users** and **removing tones which are not in a subset of tones allocated to a first user from which symbols are to be recovered.**

Accordingly, **it should be appreciated that the applied references disclose something that is very**

different from what is being claimed and even if combined they would not result in the claimed invention.

In rejecting claim 1-2, the Examiner stated:

> ... Blanchard discloses a method of processing a frequency division multiplexed signal representating a plurality of symbols and including a plurality of tones, a first subset of said plurality of tones being allocated to a first user ... filtering the frequency domain signal to remove tones in said plurality of tones which are not included in said first subset of tones (Fig. 1, Ref 22)

Applicants respectfully submit that there is no discussion in the applied reference of allocating a subset of tones to a first user. The Frequency Hopped (FH) spread spectrum signals which are rejected appear to coincide with, and are interference to, the tones used by the direct sequence (DS) spread spectrum signal of interest.

If the Examiner intends to maintain the rejection based on the Blanchard patent it is respectfully requested that the Examiner identify what subset of tones the Examiner asserts are assigned to a first user and how the tones of the Frequency Hopped signal to be filtered out relate to the subset of tones the Examiner identifies.

Applicants respectfully submit that the Blanchard patent does not distinguish between tones assigned to different users but is simply trying to filter out the

Frequency Hopped spread spectrum signal which interferes with the DS signal. One would not be motivated to use such a system intended to filter out Frequency Hopped spread spectrum signals without regard to which subsets of tones were assigned to individual users in a method such as that recited in claim 1 where the concept of a subset of tones being allocated to a user is important since the symbols will be recovered from the allocated subset of tones.

Accordingly, it is respectfully submitted that the rejections of claims 1-9 based on the Blanchard et al. patent should be withdrawn.

3. The 103 Rejection of Claims 10-13

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In rejecting claims 10-13 the Examiner states:

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37 to col. 8, line 5) (bold added for emphasis)

Applicants respectfully submit that there seems to be a miss-understanding due to the slightly unusual use of an Inverse FFT in the receiver of the Vijayan patent which the Examiner interprets as **a frequency to time domain transform module**. While an IFFT serves in many systems as a frequency to time domain transform module, it does not actually serve this purpose in the Vijayan et al. reference. In fact, in the Vijayan et al. reference the IFFT is used to convert the received signal **into the frequency domain**, i.e., the output of the circuit is a plurality of sub-carriers. Applicants respectfully submit that the transmitter shown in Fig. 2 of the Vijayan et al. patent supports Applicants' assertions and helps facilitate an understanding of the use of the IFFT in the receiver of Fig. 3.

Note that the Vijayan et al. patent uses an FFT 36 in the transmitter where an IFFT might be used in other systems. The input to the FFT 36 in the transmitter is the plurality of individual sub-carriers. It should be appreciated that when the IFFT 42 performs the inverse of the FFT 36, the result in the receiver is NOT to transform the received signal into the time domain but actually to transform the signal into the frequency domain. Note that the output of the IFFT is a plurality of sub-carrier signals (i.e., frequency domain signals) which are generated from a block of time domain values input to the FFT 42.

The ability to use the FFT in the transmitter and the IFFT in the receiver can be understood if one looks at the functions as two processing steps with the requirement that the receiver perform the inverse of the transmitter operation.

Accordingly, it should be appreciated that despite the use of the IFFT in the receiver, the Vijan et al. patent actually teaches away from the present invention **by teaching mapping from the frequency domain to symbol values**, where the frequency domain mapping depends on a period of time as a result of the conversion into the frequency domain prior to the mapping operation.

Accordingly, it should be appreciated that the Vijan et al. patent does not disclose, as recited in claim 10:

> mapping values of the filtered time domain signal **at instants in time** used **to transmit symbol values** to values in a set of symbol values

4. The 103 Rejection of Claims 14-19

The rejection of claims 14 and 19 is based on a combination of the Blanchard patent and the Vijayan patents. Both of these patents have been discussed above with respect to the rejection of claims 1 and 10. Accordingly, Applicants will not repeat the arguments in detail again.

However, Applicants respectfully submit the Blanchard patent does not render obvious the "tone filter for filtering … tones other than those included in the first subset" as discussed above with respect to the rejection of claim 1. Applicants further submit that the Vijayan patent does not disclose "a time instant to symbol mapping module …" as discussed at length with respect to the rejection of claim 10. Accordingly, the rejection of both claims 14 and 19 should be withdrawn.

5. The 103 Rejections of The Remaining claims

The rejections of the remaining claims are based on a combination of the references discussed above. Applicants respectfully submit that the Arguments raised above with respect to these references are also applicable to the other rejections based on the references made by the Examiner. Accordingly, it is respectfully submitted that the remaining rejections should be withdrawn for the reasons discussed above with respect to the rejections of the other claims.

IV. Conclusion

Applicants' undersigned representative looks forward to discussing the references and the pending claims with the Examiner.

Respectfully submitted,

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